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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/754,340	01/09/2004	Xiao-an Wang		8332

7590 09/04/2007

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EXAMINER	
DSOUZA, JOSEPH FRANCIS A	
ART UNIT	**PAPER NUMBER**
2611	
MAIL DATE	**DELIVERY MODE**
09/04/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/754,340	WANG, XIAO-AN	
	Examiner	Art Unit	
	Adolf DSouza	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 June 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 - 25* is/are pending in the application.

4a) Of the above claim(s) *6,15,22 and 24* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-5,7-9,16-21,23,25 and 26* is/are rejected.

7)☒ Claim(s) *2 and 10-14* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Response to Arguments

1. Examiner has accepted Applicant's changes in response to the objections made to the drawings, claims and Election/Restriction made in the last Office Action.

2. Applicant's arguments (as listed below) filed 6/15/2007 have been fully considered but they are not persuasive.

a) Argument: Applicant has argued that Kutz does not disclose estimating the composite channel impulse response (CIR) (Remarks 6/15/2007, page 10, 1st complete paragraph).

Response: Examiner respectfully disagrees. As stated in the Applicant's specification, the CIR is the channel impulse response described by the various multipath components i.e. amplitude and delay of each component. Kutz clearly discloses obtaining the CIR (Abstract; page 1353, left column, paragraph just before start of section III and Equation (3), where the complex amplitude and time delay are those of the CIR). In Kutz's paper, the CIR is first determined (as it is in all CDMA applications) and then from that the Rake or G-Rake parameters are then determined.

b) Argument: Applicant has argued that Kutz does not disclose estimating the noise covariances based on the CIR (Remarks 6/15/2007, page 10, 2nd last paragraph).

Response: Examiner respectfully disagrees. As disclosed in the last Office Action (3/19/2007, page 5, 1st 2 lines), Kutz disclose computing the noise covariances. Since the **u** vector is given by Equation (6) and the **h** vector is related to the CIR, the covariance does use the CIR.

c) Argument: Applicant has argued that Kutz does not disclose estimating the channel tap locations by a heuristic search based on the CIR (Remarks 6/15/2007, page 10, last paragraph).

Response: Examiner respectfully disagrees. As stated in the last Office Action (3/19/2007, page 5, line (c)) Kutz discloses estimating the channel tap locations. Since the CIR was obtained prior to the channel tap assignment, it is used in the channel tap assignment. For example, Kutz clearly states that the "L fingers are positioned on the L multipath positions" (page 1354, left column, line 5-6). If the CIR was not obtained, how could that assignment be made ?

d) Argument: Applicant has argued that Kutz does not disclose estimating the weights based on the CIR (Remarks 6/15/2007, page 10, last paragraph).

Response: Examiner respectfully disagrees. As stated before, the first step involves obtaining the CIR. The last Office Action disclosed that the weights were computed using Equation (7) in Kutz. Since the parameters in Equation (7) were computed using the CIR, the weights are indirectly computed using the CIR.

e) Argument: Applicant has argued that preselection is based on the estimated individual fingers (Remarks 6/15/2007, page 12, lines 6+).

Response: Examiner respectfully disagrees. The L fingers are positioned based on the L multipath locations, as clearly disclosed by Kutz (page 1354, left column, line 5 – 6). The multipath is obtained using CIR estimation.

f) Argument: Applicant has argued that "they did not consider nor were they aware of the composite CIR while they performed finger preselection (Remarks 6/15/2007, page 12, middle paragraph starting with "Element (b), when combined ...").

Response: As argued before, if they did not consider or were aware of the CIR, they how could the L fingers be positioned on the L multipath locations? (Kutz, page 1354, left column, line 5 – 6).

g) Argument: Applicant has argued that choosing a number of strongest channel taps is a different approach than choosing the several strongest multipath (Remarks 6/15/2007, page 12, last paragraph).

Response: Kutz discloses starting with the strongest finger and proceeding to the weakest (page 1354, left column, 1st 3 lines) .

h) Argument: Applicant has argued that Kutz did not use the rule that the distance equals the distance between a pair of pair of preselected taps(Remarks 6/15/2007, page 13, paragraphs starting with Claim 20 and Claim 21...).

Response: Examiner respectfully disagrees. As stated in the Office Action (page 6, 1st complete paragraph), in step 3 of the iterations on page 1354, the tap location is set equal to a distance between two preselected taps.

i) Argument: Applicant has argued that neither Kutz nor Wang estimate the composite CIR (Remarks 6/15/2007, page 15, 2nd paragraph).

Response: As stated in earlier bullets, Kutz disclosed estimating the CIR.

j) Argument: Applicant has argued that Kutz did not disclose the search region before they determine the finger locations (Remarks 6/15/2007, page 16, paragraph starting with Kutz et al. did not determine ...).

Response: As stated in the last Office Action (page 8, claim 3 rejection), Kutz discloses the search region (page 1353, right column, section B, line starting with "It is suggested ...").

k) Argument: Applicant has argued that Kutz did not disclose path and mirror regions and that they are different from the concept of a path and mirror of a path (Remarks 6/15/2007, page 16,middle paragraph).

Response: As stated in the last Office Action (page 8, last paragraph), Kutz discloses path and mirror regions. What Kutz give son page 1353, right column, last paragraph is only an example of a path and a mirror of that path. One of ordinary skill in the art can easily extend it to a case of several paths.

l) Argument: Applicant has argued that Kutz and Wang did not disclose that the SNR is computed based on the composite CIR (Remarks 6/15/2007, page 17, 2nd paragraph onwards).

Response: Examiner respectfully disagrees. Kutz discloses that the SNR is computed by Equation (8) which uses the **h** vector that was obtained using the CIR. Therefore, the SNR is computed based on the CIR.

m) Argument: Applicant has argued that Bottomley did not use the composite CIR to define the search region (Remarks 6/15/2007, page 19, 2nd last paragraph).

Response: Examiner respectfully disagrees. As stated in the last Office Action (page 11, middle paragraphs), Bottomley discloses the search window or region. The composite CIR estimation procedure is well known in the art and is disclosed

by both Kutz (as discussed earlier) and Bottomley (page 1537, right column, last 4 lines).

n) Argument: Applicant has argued that in Yellin, the MSE did not use the composite CIR (Remarks 6/15/2007, page 20, middle paragraph).

Response: Yellin discloses that the MSE is a function of the composite CIR. Column 14 , lines 35 – 46; as disclosed in the last Office Action (page 12).The MS E is calculated using Equation 15, 6, 7. Equation (6) clearly uses the channel tap estimates h. Therefore, the MSE uses the composite CIR.

o) Argument: Applicant has argued that one skilled in the art would not be able to combine Dabak with Kutz and Wang (Remarks 6/15/2007, page 21,1st paragraph).

Response: Examiner is using Dabak only for the 2X over sampling. Other features that Dabak may teach are not of interest in determining whether Dabak can be combined with Kutz and Wang. Over sampling is a feature that is commonly used in signal processing systems and one of ordinary skill in the art can easily incorporate it into Kutz's system.

3. Applicant's arguments, see Remarks (page 17) filed 6/15/2007 with respect to claim 10 have been fully considered and are persuasive. The rejection of claim 10 has been withdrawn.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 17 - 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Kutz et al. (On The Performance Of A Practical Downlink CDMA Generalized Rake Receiver; which has been provided by the Applicant in his IDS).

Regarding claim 17, Kutz discloses a method of recovering data in a received signal sent in a communications media (Abstract), comprising:

(a) estimating at lease one composite channel impulse response from said received signal (page 1355, left column, section 1V, 1st 5 lines);

(b) estimating a set of noise covariances based on said composite channel impulse responses (page 1353, left column, start of section A – right column, 1st 2 lines);

(c) assigning a set of channel-tap locations by a heuristic search based on said composite channel impulse response (page 1354, left column, iterations shown in *italics*. Applicant has admitted that Kutz discloses a heuristic search method (Specification, page 4, last 3 lines);

(d) computing a set of weight coefficients for said set of channel-tap locations based on said composite channel impulse response (page 1353, right column, line 12 – Equation (7); wherein the weight coefficients are w);

(e) demodulating data in said received signal with said set of channel-tap locations and said set of weight coefficients (page 1353, section III up to start of section A; wherein demodulating the data is done by the Rake receiver output, the tap locations are specified by the time delays d'_j, and the weights are as shown in Equation 5).

Regarding claim 18, Kutz discloses the heuristic search comprises:

(a) pre-selecting a first set of channel-tap locations based on said composite channel impulse response (page 1354, left column, lines 5 – 6; wherein pre-selecting a first set of tap locations is done by positioning the first L fingers on the L multipaths);

(b) selecting a second set of channel-tap locations in said search region by a heuristic search scheme based on said composite channel impulse response (page 1353, iterations shown in *italics).*

Regarding claim 19, Kutz discloses pre-selecting said first set of channel-tap locations comprises choosing a number of strongest channel taps according to said composite channel impulse response, the distances among which are equal to or larger than a predetermined minimum distance (page 1354, left column, 1st 5 lines).

Regarding claim 20, Kutz discloses heuristic search scheme comprises choosing a number of channel taps, where the distance of a thus-chosen channel tap to another thus-chosen channel tap or to a pre-selected channel tap equals to the distance between a pair of pre-selected channel taps (page 1353, steps in *italics*; steps 1 and 3; wherein the new tap is set according to the difference between two previously set locations).

Claim 21 is similarly analyzed as claim 20.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1, 3, 5, 7, 9, 10, 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kutz et al. (On The Performance Of A Practical Downlink CDMA Generalized Rake Receiver) in view of Wang et al. (US 20010028677; which has been provided by the Applicant in his IDS).

Regarding claim 1, Kutz discloses a method of recovering data in a received signal sent in a communications media (Abstract), comprising:

(a) estimating atleast one composite channel impulse response from said received signal (page 1355, left column, section 1V, 1st 5 lines);

(b) estimating a set of noise covariances based on said composite channel impulse response (page 1353, left column, start of section A – right column, 1st 2 lines);

(d) computing a set of weight coefficients for said set of channel-tap locations based on said composite channel impulse response (page 1353, right column, line 12 – Equation (7); wherein the weight coefficients are w);

(e) demodulating data in said received signal with said set of channel-tap locations and said set of weight coefficients (page 1353, section III up to start of section A; wherein

demodulating the data is done by the Rake receiver output, the tap locations are specified by the time delays d'_j, and the weights are as shown in Equation 5).

Kutz does not disclose (c) assigning a set of channel-tap locations by a sequential search.

In the same field of endeavor, however, Wang discloses (c) assigning a set of channel-tap locations by a sequential search based on said composite channel impulse response (Fig. 9; page 8, paragraph 82 – page 9, paragraph 85; wherein the sequential search is done as shown in Fig. 9).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Wang, in the system of Kutz because this would enable tap locations be selected based on the SNR being maximized, as disclosed by Kutz.

Regarding claim 3, Kutz discloses sequential search comprises:

(a) determining a search region (page 1353, right column, section B, line starting with "It is suggested ... ")

(b) pre-selecting a first set of channel-tap locations in said search region based on said composite channel impulse response if said first set is predetermined to be non-empty (

page 1354, left column, lines 5 – 6; wherein pre-selecting a first set of tap locations is done by positioning the first L fingers on the L multipaths);

The limitation regarding "sequentially selecting a second set of channel-tap locations in said search region based on first set of channel tap locations to optimize a design" is analyzed as in claim 1 above.

Regarding claim 5, Kutz discloses the search region is a union of a set of path regions and a set of mirror image regions (page 1353, right column, line starting with "Let us consider a two-ray channel ...." – page 1354 ,1st 2 lines; wherein the mirror image region is the symmetrical position that is used).

Regarding claim 7, Kutz discloses pre-selecting said first set of channel-tap locations comprises choosing a number of strongest channel taps according to said composite channel impulse response, the distances among which are equal to or larger than a predetermined minimum distance (page 1354, left column, 1st 5 lines).

Regarding claim 9, Kutz discloses said design criterion is signal-to-noise ratio, whereby the signal-to-noise ratio is computed based on said composite channel impulse response (page 1353, right column, line starting with "It is suggested ..." – line ending with " ...the best place to position additional finger would be ..").

Regarding claim 10, Kutz does not disclose selecting the second set of tap locations optimizes design criterion based on a recursive evaluation.

In the same field of endeavor, however, Wang discloses sequentially selecting said second set of channel-tap locations to optimize said design criterion comprises choosing a new channel-tap location that optimizes said design criterion based on a recursive evaluation that explicitly depends on: (a) a set of previously evaluated functions of all previously chosen channel-tap locations, and (b) a set of functions of said new channel-tap location, whereby said recursive evaluation can reduce the amount of computations (Fig. 9; page 8, paragraph 82 – page 9, paragraph 85; wherein the sequential search is done as shown in Fig. 9; wherein the second set of tap locations is as shown in Fig.9, optimizing the design criterion is interpreted as maximizing the SNR, the previously evaluated function of previous tap locations is interpreted as the SNR_{max} that was computed in the past iterations, the set of function for the new tap location is interpreted as the new SNR that computed for this iteration).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Wang, in the system of Kutz because this would enable tap locations be selected based on the SNR being maximized, as disclosed by Kutz.

Claim 25 is similarly analyzed as claim 1.

8. Claims 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kutz et al. (On The Performance Of A Practical Downlink CDMA Generalized Rake Receiver)

in view of Wang et al. (US 20010028677; which has been provided by the Applicant in his IDS) and further in view of Bottomley et al. (A Generalized RAKE Receiver For Interference Suppression; IEEE Journal on Selected areas in Communications; Vol. 18, No.8; August 2000; pages 1536 – 1545).

Regarding claim 4, the combined invention of Kutz and Wang does not disclose that the search region also comprises a pre-channel-impulse-response section, and a post-channel-impulse-response section.

In the same field of endeavor, however, Bottomley discloses search region is a contiguous region comprising a span of the composite channel impulse response, a pre-composite-channel-impulse-response section, and a post-composite-channel-impulse-response section (page 1540, right column, paragraph just before section C).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Bottomley, in the combined system of Kutz and Wang because this would allow all potential delays to be found, as disclosed by Bottomley.

9. Claims 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kutz et al. (On The Performance Of A Practical Downlink CDMA Generalized Rake Receiver)

in view of Wang et al. (US 20010028677; which has been provided by the Applicant in his IDS) and further in view of Yellin (US 6,618,433).

Regarding claim 8, the combined invention of Kutz and Wang does not disclose the design criterion is mean square error.

In the same field of endeavor, however, Yellin discloses the design criterion is mean square error, whereby the means square error is computed based on said composite channel impulse response (column 14, lines 35 - 46).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Yellin, in the combined system of Kutz and Wang because this would enable the delays to be determined by using the MSE, as disclosed by Yellin.

10. Claims 16, 23 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kutz et al. (On The Performance Of A Practical Downlink CDMA Generalized Rake Receiver) in view of Wang et al. (US 20010028677; which has been provided by the Applicant in his IDS) and further in view of Dabak et al. (US 6,345,069).

Regarding claim 16, the combined invention of Kutz and Wang does not disclose the receiver uses 2x over sampling.

In the same field of endeavor, however, Dabak discloses recovering data in said received signal sent in a communications media is performed at 2 X over sampling (column 3, line 61 – column 4, line 2) .

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Dabak, in the combined system of Kutz and Wang because this would provide a comprise between accuracy, circuit complexity and power consumption, as disclosed by Dabak.

Claims 23 and 26 are similarly analyzed as claim 16.

Allowable Subject Matter

11. Claims 2, 10 – 14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Other Prior Art Cited

12. The prior art made of record and not relied upon is considered pertinent to the applicant's disclosure.

The following patents are cited to further show the state of the art with respect to Rake receivers:

Bottomley (US 5,506,861) discloses System and method for joint demodulation of CDMA signals.

Dent et al. (US 5,572,552) discloses Method and system for demodulation of downlink CDMA signals.

Bottomley (US 6,363,104) discloses a Method and apparatus for interference cancellation in a rake receiver.

Schelm et. al. (US 20030235238) discloses Multipath channel tap delay estimation in a CDMA spread spectrum receiver.

Conclusion

13. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Adolf DSouza whose telephone number is 571-272-1043. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Payne can be reached on 571-272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Adolf DSouza
Examiner
Art Unit 2611

AD

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SUPERVISORY PATENT EXAMINER